Claims

1. An arrangement for controlling a combustion engine whereby the combustion engine (1) comprises a combustion chamber (3), a movable piston (4) adapted to compressing a fuel mixture in the combustion chamber (3) so that self-ignition of the fuel mixture takes place, a crankshaft (5) driven by movements of the piston (4), an inlet valve (8) to the combustion chamber (3) and an exhaust valve (11) from the combustion chamber (3), which arrangement comprises a control unit (19) adapted to controlling the self-ignition of the fuel mixture to an optimum crankshaft angle (cad_{iopt}) within a load range (L_{tot}), characterised in that said load range (L_{tot}) can be divided into at least two subranges (L_I, L_{II}) and the control unit (19) is adapted to controlling the self-ignition of the fuel mixture towards an optimum crankshaft angle (cad_{iopt}) within a first subrange (L_I) by means of a strategy (I) which entails a variable amount of hot exhaust gases being supplied to or retained in the combustion chamber (3), and within a second subrange (L_{II}) by means of another strategy (II) which entails the effective compression ratio (c) in the cylinder (2) being varied.

2. An arrangement according to claim 1, characterised in that the control unit (19) is adapted to initiating exhaust valve closure (evc) and inlet valve opening (ivo) within the first subrange (L_I) in such a way that a variable amount of hot exhaust gases from a combustion process is retained in the combustion chamber (3).

3. An arrangement according to claim 2, characterised in that the control unit (19) is adapted to initiating inlet valve closure (ivc_{opt}) within the first subrange (L_I) in such a way as to result in an optimum effective compression ratio in the cylinder (2).

4. An arrangement according to any one of the foregoing claims, characterised in that the control unit (19) is adapted to varying the effective compression ratio in the cylinder (2) within the second subrange (L_{II}) by initiating inlet valve closure (ivc) at a variable crankshaft angle.

5. An arrangement according to claim 4, characterised in that the control unit (19) is adapted to initiating exhaust valve closure (evc_{opt}) and inlet valve opening (ivo_{opt}) within the second subrange (L_{II}) at crankshaft angles at which minimum fuel consumption is obtained.

6. An arrangement according to any one of the foregoing claims, characterised in that the arrangement comprises at least one hydraulic control system (18a, b) for lifting the inlet valve (8) and the exhaust valve (11).

7. An arrangement according to any one of the foregoing claims, characterised in that the arrangement comprises a sensor (16) for detecting a parameter (p) which indicates the start of a combustion process in the combustion chamber (3), and a sensor (17) for estimating the crankshaft angle (cad) of the combustion engine (1), and the control unit (19) is adapted to determining the crankshaft angle (cad_i) for the start of the combustion process.

8. An arrangement according to claim 5, characterised in that said sensor is a pressure sensor (16) which detects the pressure in the combustion chamber (3).

9. An arrangement according to claim 7 or 8, characterised in that the control unit (19) is adapted to comparing the actual crankshaft angle (cad_i) at the self-ignition of the combustion process with stored information concerning the optimum crankshaft angle (cad_{iopt}) for self-ignition of the combustion process and to using that information for controlling the self-ignition of the following combustion process.

10. An arrangement according to any one of the foregoing claims, characterised in that the arrangement comprises an inlet line (7) for air supply to the combustion chamber and an inlet nozzle (10) for fuel injection into the combustion chamber (3).

11. A method for controlling a combustion engine whereby the combustion engine (1) comprises a combustion chamber (3), a movable piston (4) adapted to compressing a fuel mixture in the combustion chamber (3) so that self-ignition of the fuel mixture takes place, a crankshaft (5) driven by movements of the piston (4), an inlet valve (8) to the combustion chamber (3) and an exhaust valve (11) from the combustion chamber (3), which method comprises the step of controlling the self-ignition of the fuel mixture towards an optimum crankshaft angle (cad_{iopt}) within a load range (L), characterised by the steps of dividing said load range (L) into at least two subranges (L_I, L_{II}) and of controlling the self-ignition of the fuel mixture towards an optimum crankshaft angle (cad_{iopt}) within a first subrange (L_I) by means of a strategy (I) which entails a variable amount of hot exhaust gases being supplied to or retained in the combustion chamber (3), and within a second subrange (L_{II}) by means of second

strategy (II) which entails the effective compression ratio (c) in the cylinder (2) being varied.

12. A method according to claim 11, characterised by the step of initiating exhaust valve closure (evc) and inlet valve opening (ivo) within the first subrange (L_I) in such a way that a variable amount of hot exhaust gases from a combustion process is retained in the combustion chamber (3).

13. A method according to claim 12, characterised by the step of initiating inlet valve closure (ivc_{opt}) within the first subrange (L_I) in such a way as to result in an optimum effective compression ratio in the cylinder (2).

14. A method according to any one of the claims 11-13 above, characterised by the step of varying the effective compression ratio in the cylinder (2) within the second subrange (L_{II}) by initiating inlet valve closure (ivc) at a variable crankshaft angle.

15. A method according to claim 14, characterised by the step of initiating exhaust valve closure (evc_{opt}) and inlet valve opening (ivo_{opt}) within the second subrange (L_{II}) at crankshaft angles which result in minimum fuel consumption.

16. A method according to any one of the claims 11-15 above, characterised by the step of lifting the inlet valve (8) and the exhaust valve (11) by means of at least one hydraulic control system (18a, b).

17. A method according to any one of the claims 11-16 above, characterised by the steps of detecting a parameter (p) which indicates the start of a combustion process in the combustion chamber (3), of estimating the crankshaft angle (cad) of the combustion engine (1), and of estimating the crankshaft angle (cad_i) at the start of the combustion process.

18. A method for according to claim 17, characterised by the step of detecting the pressure in the combustion chamber (3).

19. A method according to claim 17 or 18, characterised by the steps of comparing the actual crankshaft angle (cad_i) at the self-ignition of the combustion process with stored information concerning the optimum crankshaft angle (cad_{iopt}) for self-ignition of the

combustion process, and of using that information for controlling the self-ignition of the following combustion process.

20. A method according to any one of claims 11-19 above, characterised by the steps of supplying air to the combustion chamber via an inlet line (7) for injecting fuel into the combustion chamber (3) via an injection nozzle (10).